# PATENT SPECIFICATION

(11) 1 243 894

NO DRAWINGS

1 243 894

(21) Application No. 52513/69 (22) Filed 27 Oct. 1969
(31) Convention Application No. 171 578 (32) Filed 28 Oct. 1968 in
(33) France (FR)
(45) Complete Specification published 25 Aug. 1971
(51) International Classification B 23 k 9/04 C 22 c 39/20
(52) Index at acceptance
B3R 33 36 37A1X
C7A 711 A249 A253 A25Y A28X A28Y A30Y A311 A339 A349 A35Y A360 A389 A409 A439 A459 A509 A529 A53Y A545 A55Y A565 A58Y A593 A609 A61Y A62X A671 A673 A675 A677 A679 A67X A681 A683 A685 A687 A689 A68X A693 A695 A697 A699 A69X A70X


## (54) IMPROVEMENTS IN METHOD OF MANUFACTURING ALUMINIUM BRONZE—STAINLESS STEEL BIMETALLIC PLATES

SPECIFICATION NO. 1,243,894

By a direction given under Section 17 (1) of the Patents Act 1949 this application proceeded in the name of CREUSOT-LOIRE, a French Corporate Body of 5 Rue De Monttessuy, 75 Paris 07, France.

THE PATENT OFFICE

R 4905/4

and by the following statement:—

The present invention relates to a method of manufacturing bimetallic plates of aluminum bronze and stainless steel, by facing with deposited metal by means of arc welding. This invention is also concerned with bimetallic plates obtained by carrying out this method, notably those intended for use as tube plates of heat transfer devices and the like.

Facing austenitic and austenitic-ferritic stainless steels by depositing aluminum-bronze by arc-welding is attended by the serious drawback of producing cracks under the bead in the base steel.

This cracking can be avoided by resorting to the method of this invention which permits of producing sound, highly reliable bimetallic plates, suitable notably for constructing tube plates for heat transfer devices and the like (as currently used in case corrosion by sea water is to be feared).

The method of this invention consists in obtaining a bimetallic plate from a base plate of austenitic or austenitic-ferritic stainless steel, by facing this base plate by arc-welding with an intermediate layer of austenitic-ferritic stainless steel having a ferrite content ranging from 10% to 20% ferrite by weight, then depositing a layer of aluminum bronze on said intermediate layer, also by arc-welding.

According to a preferred but non-limiting

[*Price 25p*]

and assaying as follows:

| | | |
|---|---|---|
| C | = | 0.05% |
| Si | = | 0.5% |
| Mn | = | 0.5% |
| Cr | = | 20% |
| Ni | = | 8% |
| Mo | = | 2.5% |
| Cu | = | 1.5% |

All known and conventional arc-welding processes, whether manual or automatic, may be used for depositing the above-defined intermediate layer and facing same with aluminum bronze.

An advantageous application of this manufacturing method is notably the construction of bimetallic tube plates of heat transfer devices and the like.

Plates constructed according to at least the preferred embodiments of this invention are characterized by the following advantageous features in comparison with those obtained through other known methods:

—a sound alloy is definitely warranted,

—a higher mechanical strength is obtained, as well as

—an improved corrosion-resisting structure.

In order to afford a clearer understanding of this invention, a typical form of embodiment thereof will now be described by way of example in the case of the construction of four tube plates for heat transfer devices

# PATENT SPECIFICATION

(11) 1 243 894

NO DRAWINGS

1 243 894

(21) Application No. 52513/69 (22) Filed 27 Oct. 1969

(31) Convention Application No. 171 578 (32) Filed 28 Oct. 1968 in

(33) France (FR)

(45) Complete Specification published 25 Aug. 1971

(51) International Classification B 23 k 9/04 C 22 c 39/20

(52) Index at acceptance

B3R 33 36 37A1X

C7A 711 A249 A253 A25Y A28X A28Y A30Y A311 A339 A349 A35Y A360 A389 A409 A439 A459 A509 A529 A53Y A545 A55Y A565 A58Y A593 A609 A61Y A62X A671 A673 A675 A677 A679 A67X A681 A683 A685 A687 A689 A68X A693 A695 A697 A699 A69X A70X


## (54) IMPROVEMENTS IN METHOD OF MANUFACTURING ALUMINIUM BRONZE—STAINLESS STEEL BIMETALLIC PLATES


(71) We, COMPAGNIE DES ATELIERS ET FORGES DE LA LOIRE (ST CHAMOND—FIRMINY—ST ETIENNE—JACOB-HOLTZER), a body corporate of the French Republic, of 12, rue de la Rochefoucauld, Paris, France,

do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a method of manufacturing bimetallic plates of aluminum bronze and stainless steel, by facing with deposited metal by means of arc welding. This invention is also concerned with bimetallic plates obtained by carrying out this method, notably those intended for use as tube plates of heat transfer devices and the like.

Facing austenitic and austenitic-ferritic stainless steels by depositing aluminum-bronze by arc-welding is attended by the serious drawback of producing cracks under the bead in the base steel.

This cracking can be avoided by resorting to the method of this invention which permits of producing sound, highly reliable bimetallic plates, suitable notably for constructing tube plates for heat transfer devices and the like (as currently used in case corrosion by sea water is to be feared).

The method of this invention consists in obtaining a bimetallic plate from a base plate of austenitic or austenitic-ferritic stainless steel, by facing this base plate by arc-welding with an intermediate layer of austenitic-ferritic stainless steel having a ferrite content ranging from 10% to 20% ferrite by weight, then depositing a layer of aluminum bronze on said intermediate layer, also by arc-welding.

According to a preferred but non-limiting feature the intermediate layer is of stainless austenitic ferritic steel which includes by weight Cr, Ni and Mo selected from the following ranges 17% to 22% Cr, 8% to 12% Ni, and 2% to 4% Mo.

According to another preferred feature the intermediate layer consists of a steel grade already manufactured by the Applicant and assaying as follows:

| | | |
|---|---|---|
| C | = | 0.05% |
| Si | = | 0.5% |
| Mn | = | 0.5% |
| Cr | = | 20% |
| Ni | = | 8% |
| Mo | = | 2.5% |
| Cu | = | 1.5% |

All known and conventional arc-welding processes, whether manual or automatic, may be used for depositing the above-defined intermediate layer and facing same with aluminum bronze.

An advantageous application of this manufacturing method is notably the construction of bimetallic tube plates of heat transfer devices and the like.

Plates constructed according to at least the preferred embodiments of this invention are characterized by the following advantageous features in comparison with those obtained through other known methods:

—a sound alloy is definitely warranted,

—a higher mechanical strength is obtained, as well as

—an improved corrosion-resisting structure.

In order to afford a clearer understanding of this invention, a typical form of embodiment thereof will now be described by way of example in the case of the construction of four tube plates for heat transfer devices

having a diameter of 994 millimeters and utilizing sea water as a heat carrier medium.

For each plate the base metal is an austenitic stainless steel assaying as follows: Cr=18%, Ni=12% and C<0.030%, having a thickness of 53 mm. An intermediate layer of austenitic ferritic stainless steel assaying as follows: Cr=20%, Ni=8%, Mo =2.5%, Cu=1.5% and C<0.050% is deposited on the base layer or plate by arc-welding.

Then, a 15 mm thick layer of aluminum bronze is deposited thereon by arc-welding.

These plates are subsequently perforated by drilling therethrough 1,021 holes having a diameter of 3/4", without observing any crack formation, and bimetallic tubes of the same grade as the base plates are fitted through these holes. The resulting assembly is both homogeneous and economical.

WHAT WE CLAIM IS:—

1. Method of manufacturing bimetallic plates of stainless steel and aluminium bronze which comprises facing a base plate of austenitic or austenitic-ferritic stainless steel by means of arc welding with an intermediate layer of austenitic-ferritic stainless steel having a ferrite content ranging from 10% to 20% ferrite by weight, said intermediate layer being subsequently faced with a layer of aluminum bronze by arc-welding.

2. Method according to claim 1, in which the intermediate layer of austenitic-ferritic stainless steel includes by weight Cr, Ni and Mo selected from the following ranges: 17% to 22% Cr, 8% to 12% Ni and 2% to 4% Mo.

3. Method according to claim 1, in which the intermediate layer of austenitic-ferritic stainless steel includes the following:

| | | |
|---|---|---|
| C | = | 0.05% |
| Si | = | 0.5% |
| Mn | = | 0.5% |
| Cr | = | 20% |
| Ni | = | 8% |
| Mo | = | 2.5% |
| Cu | = | 1.5% |

4. A method of manufacturing bimetallic plates substantially as described herein.

5. Bimetallic plates obtained by carrying out the method described in any one of claims 1, 2, 3 and 4, such plates being bimetallic plates of heat transfer devices and the like.

For the Applicants,
RAWORTH, MOSS & COOK,
38 Sydenham Road,
Croydon, Surrey,
and
75 Victoria Street,
Westminster, London, S.W.1.

Printed for Her Majesty's Stationery Office by Burgess & Son (Abingdon), Ltd.—1971.
Published at The Patent Office, 25 Southampton Buildings, London, WC2A 1AY
from which copies may be obtained.